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TECHNICAL NOTES
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THE DEVELOPMENT OF FOREST SOIL ORGANIC LAYERS IN RELATION TO TIME IN SOUTHEAST ALASKA

Much of the mountainous land area in Southeast Alaska supports old-growth timber stands consisting principally of western hemlock (Tsuga heterophylla (Raf.) Sarg.) and Sitka spruce (Picea sitchensis (Bong.) Carr.). Sites supporting these stands have remained comparatively undisturbed for many hundreds of years. Mature, unincorporated organic layers have developed and are probably as nearly in equilibrium with their environment as any occurring in nature.

Occasionally landslides occur that completely remove vegetation and the upper soil mantle. These slide areas are soon covered with vegetation. Stands of alder and spruce develop. Red alder (Alnus rubra Bong.) first occurs as the dominant vegetation, but being shortlived, it is soon overtaken by spruce. Pure stands of spruce occupy the site for two to three hundred years and are then gradually invaded by the more shade-tolerant western hemlock.

Unincorporated forest soil organic layers were sampled in the vicinity of the Maybeso Experimental Forest on Prince of Wales Island. Organic layer samples from well-drained soils were obtained from two landslides that occurred about 125 and 230 years ago and from beneath old-growth stands near the slides.

Both slide areas supported dense stands of almost pure Sitka spruce. Old-growth stands were primarily western hemlock with occasional spruce and western redcedar (Thuja plicata Donn). Minor vegetation in the slide areas was sparse, consisting of Cornus canadensis, Tiarella trifoliata, Rubus spectabilis, and a few species of ferns. A thin layer of mosses, predominately Hylocomium spp. covered the ground surface. In the mature areas Vaccinium spp. were moderately abundant, as were smaller species of minor vegetation and the ground surface was blanketed with a thick layer of mosses, again predominately Hylocomium spp.

Methods and Results

A measured square board was placed on the surface of the A_0 horizon and vertical cuts extending to mineral soil were made around its sides. The A_0 sample beneath the board was removed to the sharply segregated point where the mineral horizons begin. Average depth of the sample was recorded. Large roots, down trees, or other highly variable accumulations of organic debris were avoided.

Organic layer samples were uniformly air-dried and weighed. Oven-dry (105^{o}-110^{o}C) weights for conversion to oven-dry basis were determined with subsamples.

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Average depth, acre weight, and volume weight[1/] at 125, 230, and 300+ years are shown in the table below. Figure 1 shows the relationship of weight (oven-dry) of the organic layer to age.

Age, yrs.	Depth in.	Oven-dry wt., lbs. per acre	Vol. wt.	No. samples	Sampling error 1/ depth	Sampling error 1/ wt./acre	Sampling error 1/ Vol. wt.
125	1.59	47,916	.136	11	1.08	35,349	.091
230	4.02	165,608	.183	4	1.42	83,010	.092
300+	6.20	235,418	.172	6	2.86	44,401	.073

1/ 95% level of probability

The large variable accumulations of organic debris, which were avoided in sampling, would add considerably to the total weight per acre. Even without these variable accumulations the sampling errors show that variation around the means is quite large.

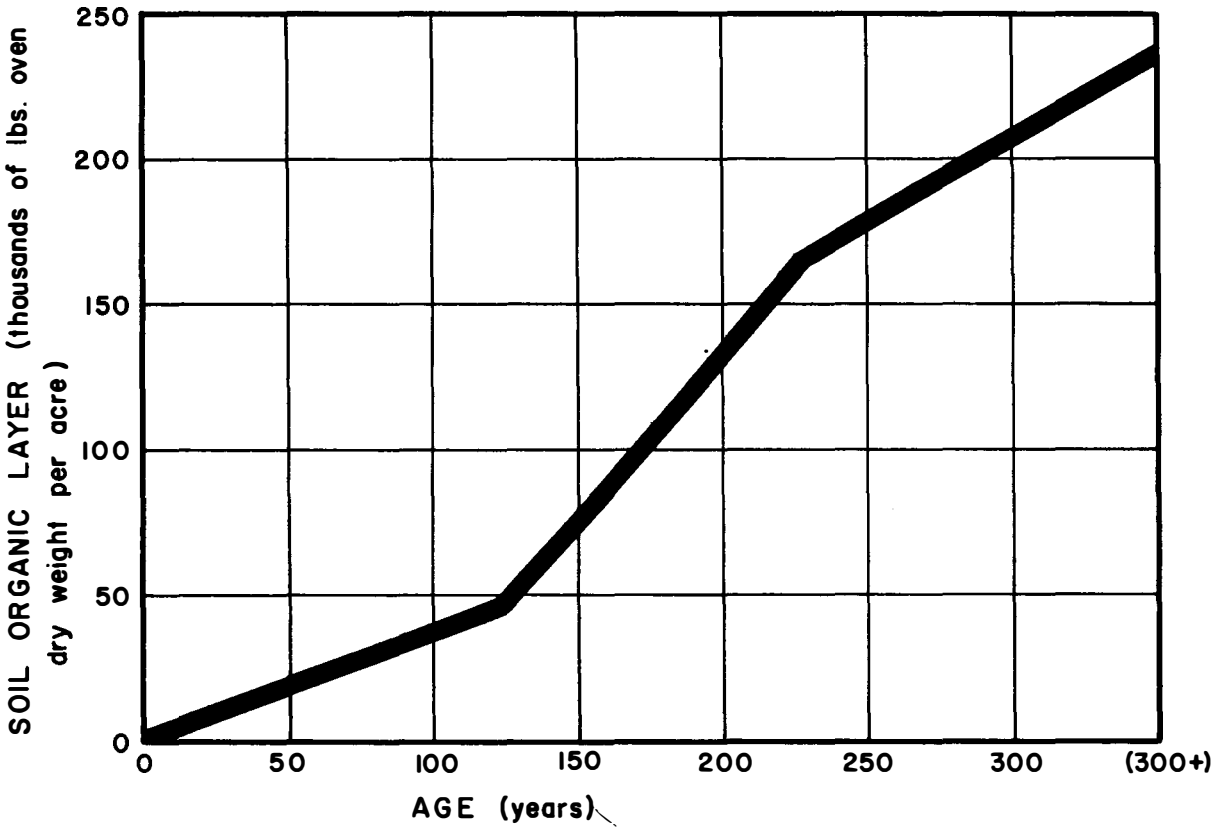

Figure 1. -- Development of forest soil organic layer in relation to stand age.

1/ Volume weight = $\frac{\text{weight of given volume of soil}}{\text{weight of equal volume of water}}$

The samples are limited and the data fragmentary, but they give some information on rate of organic layer development. At the end of 125 years 20 percent of the mature weight was accumulated. This is an average accumulation of 383 pounds per acre per year for the first 125 years. Between 125 and 230 years an additional 50 percent, or an average of 1,121 pounds per acre per year was accumulated. Thirty percent more was required to bring the A_0 horizon to the weight encountered at maturity.

There was an increase in volume weight between 125 and 230 years but little difference between 230 years and maturity. The observed increase may be due to development of a well-decomposed H-layer.

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